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Effectiveness of three different rotary systems in removing gutta percha from root canals

Dr. Haroon Deshmukh*

Senior Lecturer, Department of conservative dentistry and endodontics
Aditya Dental college & Hospital , Beed Maharashtra
*Corresponding author

Dr. Shaik Mohammed Arif

Professor
Department of conservative dentistry and endodontics care dental college,
Guntur Andhra pradesh

Dr. R.Vijay Kumar,

MDS, Associate professor, Dept of dentistry/surgery. Kurnool medical college.
Andhra Pradesh

Dr. Rohit Wadhwa

Lecturer Department of conservative dentistry and endodontics Desh bhagat
Dental college mandi gobindgarh.

Dr. Tawanpreet Kaur

Reader
Conservative Dentistry and Endodontics, Shaheed Kartar Singh Sarabha
Dental College, Sarabha ludhiana

Dr. Bhavneesh Goel

Associate professor
Department of oral and maxillofacial surgery Genesis, Dental
College, Ferozepur

Abstract---Background: The present study was conducted for comparing the effectiveness of three different Rotary systems in removing gutta percha from root canals. Materials & methods: 30 single rooted freshly extracted, mandibular premolars were collected and stored in 10% formalin until further use. Crowns of selected teeth were decoronated using diamond disc to standardize the working length to 16 mm for each specimen. Access preparation was done on each tooth and a size 10 K-type file was

inserted into the canal until it was visible at the apical foramen to ensure that the canal was patent. Afterwards, all the specimens were randomly divided into three study groups according to type of retreatment system. Group A: ProTaper Universal retreatment Ni-Ti rotary instrumentation system, Group B: Mtwo retreatment Ni-Ti rotary instrumentation system, and Group C: R-Endo Ni-Ti rotary instrumentation system. After tooth splitting, each half of every specimen was separately imaged. Digitized images of each third of the root canal of each half of every specimen were obtained and evaluated. All the results were recorded and analysed by SPSS software. Results: Mean residual filling material among specimens of group A, Group B and group C was 6.96 mm², 8.98 mm² and 9.84 mm² respectively. While comparing statistically, significant results were obtained. Conclusion: ProTaper Universal retreatment Ni-Ti rotary instrumentation system was the most effective among the three rotary systems in removing gutta percha from canals.

Keywords---Retreatment, Rotary, Root canal

Introduction

Complete removal of gutta-percha (GP) from the root canal system is a major goal in retreatment and it can be time-consuming and challenging. Retreatment is recommended in order to re-establish healthy periapical tissues after inefficient treatment or re-infection of the obturated root canal system because of coronal or apical leakage. It requires regaining access to the entire root canal system through removal of the original root canal filling, further cleaning and disinfection and finally re-obturation. Necrotic tissue or bacteria, covered by remaining GP or sealer, may be responsible for periapical inflammation or pain. Residual bacteria have to be uncovered through removal of as much obturation material as possible. This enables thorough chemo-mechanical re-instrumentation and re-disinfection of the root canal system. The primary goal of root canal retreatment is to stop the infectious process through the removal of filling material, debris and microorganisms that cause apical periodontitis.¹⁻³

Many different instrumentation motions and devices are available for removing GP, including hand files, nickel-titanium (NiTi) rotary instruments, ultrasonic devices and lasers. However, none of these techniques are fully effective in removing the filling materials.⁴⁻⁶ Hence; the present study was conducted for comparing the effectiveness of three different Rotary systems in removing gutta percha from root canals.

Method

Materials & methods

The present study was conducted for comparing the effectiveness of three different Rotary systems in removing gutta percha from root canals. 30 single rooted freshly extracted, mandibular premolars were collected and stored in

10% formalin until further use. Crowns of selected teeth were decoronated using diamond disc to standardize the working length to 16 mm for each specimen. Access preparation was done on each tooth and a size 10 K-type file was inserted into the canal until it was visible at the apical foramen to ensure that the canal was patent. Working length was established 1 mm short of this length. Root canal of each tooth was dried with paper points and obturated with gutta-percha and AH Plus sealer using lateral compaction. Sealer was mixed and master cone coated with sealer was inserted into the canal. Spreader was inserted to within 2 mm of working length to laterally pack the gutta-percha. Specimens were radiographed in buccolingual direction to confirm the adequacy of root filling. All specimens were kept at 37°C for 2 weeks at 100% humidity to allow complete setting of the sealer. Afterwards, all the specimens were randomly divided into three study groups according to type of retreatment system.

Group A: ProTaper Universal retreatment Ni-Ti rotary instrumentation system.

Group B: Mtwo retreatment Ni-Ti rotary instrumentation system.

Group C: R-Endo Ni-Ti rotary instrumentation system.

After tooth splitting, each half of every specimen was separately imaged. Digitized images of each third of the root canal of each half of every specimen were obtained and evaluated. All the results were recorded and analysed by SPSS software.

Results

Mean residual filling material among specimens of group A, Group B and group C was 6.96 mm², 8.98 mm² and 9.84 mm² respectively. While comparing statistically, significant results were obtained.

Table 1
Comparison of residual filling material

Residual filling material	Group A	Group B	Group C
Mean (mm ²)	6.96	8.98	9.84
SD	2.1	2.9	3.2
p- value	0.001 (Significant)		

Discussion

Non-surgical endodontic retreatment is done mainly to eliminate the persistent infection of the root canal system. Enterococcus faecalis have been identified predominantly from the failed root canals. Retreatment requires complete removal of the root canal filling material, followed by further shaping, cleaning, disinfection and re-obturation to reestablish healthy periapical tissues. Removal of gutta-percha and sealer is an important factor in root canal retreatment, since this enables thorough chemo-mechanical instrumentation and disinfection of the root canal system. Thermal, mechanical, chemical and a combination of the three methods are used to remove the gutta percha and the

sealer. These methods while removing the gutta percha and the sealer from the root canal can also cause apical extrusion irrespective of the technique used. This apical extrusion can lead to irritation of periapical tissue, periapical inflammation, post-instrumentation flare-up or even failure of apical healing.⁷⁻¹⁰ Hence; the present study was conducted for comparing the effectiveness of three different Rotary systems in removing gutta percha from root canals.

Mean residual filling material among specimens of group A, Group B and group C was 6.96 mm², 8.98 mm² and 9.84 mm² respectively. While comparing statistically, significant results were obtained. Marfisi K et al evaluated the efficacy of ProTaper Retreatment files, Mtwo Retreatment files and Twisted Files for removal of gutta-percha and Resilon in straight root canals. Ninety single root canals were instrumented and randomly allocated into 6 groups of 15 specimens each with regards to the filling material and instruments used. Group 1: gutta-percha/ProTaper; Group 2: Resilon/ProTaper; Group 3: gutta-percha/Mtwo; Group 4: Resilon/Mtwo; Group 5: gutta-percha/Twisted Files; Group 6: Resilon/Twisted Files. No system completely removed the root filling material from root canal walls. No significant differences were observed between the rotary systems in terms of the area of filling material left within the canals (P>0.05). There were statistically significant differences between the filling materials: Resilon/Real Seal had less residual material than gutta-percha/AH plus (CBCT: P=0.01; microscope: P=0.018). Mtwo Retreatment files were more rapid when removing filling material than ProTaper Retreatment files (P=0.19) and Twisted Files (P=0.04). No system removed the root filling materials entirely. Mtwo Retreatment files required less time to remove root filling material than the other instruments.¹¹

Joseph M et al assessed the efficacy of three different rotary nickel titanium retreatment systems and Hedstrom files in removing filling material from root canals. Sixty extracted mandibular premolars were decoronated to leave 15 mm root. Specimen were hand instrumented and obturated using gutta percha and AH plus root canal sealer. After storage period of two weeks, roots were retreated with three (Protaper retreatment files, Mtwo retreatment files, NRT GPR) rotary retreatment instrument systems and Hedstroem files. Subsequently, samples were sectioned longitudinally and examined under stereomicroscope. Digital images were recorded and evaluated using Digital Image Analysing Software. The retreatment time was recorded for each tooth using a stopwatch. The area of canal and the residual filling material was recorded in mm² and the percentage of remaining filling material on canal walls was calculated. Significantly less amount of residual filling material was present in protaper and Mtwo instrumented teeth (p < 0.05) compared to NRT GPR and Hedstrom files group. Protaper instruments also required lesser time during removal of filling material followed by Mtwo instruments, NRT GPR files and Hedstrom files. None of the instruments were able to remove the filling material completely from root canal. Protaper universal retreatment system and Mtwo retreatment files were more efficient and faster compared to NRT GPR files and Hedstrom files.¹²

Conclusion

ProTaper Universal retreatment Ni-Ti rotary instrumentation system was the most effective among the three rotary systems in removing gutta percha from canals.

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